

How development can effect Stream Health

Anatomy of a Natural Stream

How development can effect Stream Health

Suburban Encroachment

How development can effect Stream Health

The Urban Stream

TheCupits

NPS

Encyclopedia of Non-Point Source Pollution

Nutrients

Nutrients
Pathogens
Sediment
Toxic Contaminants
Debris
Thermal Stress

Nutrients = chemicals needed for plant growth.
 • High levels in drinking water = health hazard.
 • High levels in streams and ponds = excessive plant growth, which consumes the oxygen in the water when it decays - killing aquatic animals.

Sources: septic systems, farm waste, lawn & garden fertilizers, auto emissions

Encyclopedia of Non-Point Source Pollution

Pathogens

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Thermal Stress

Pathogens = disease-causing bacteria and viruses spread by human and animal feces.

Sources: failing septic systems, pet & farm animal waste, marine sanitation systems

Encyclopedia of Non-Point Source Pollution

Sediment

Nutrients
Pathogens
Sediment
Toxic Contaminants
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Thermal Stress

Sediment = soil or sand carried in water.
 • Sediment (a.k.a silt) smothers aquatic habitat, carries pollutants, and reduces water clarity.

Sources: road sand, construction sites, tilled fields, skid trails - any disturbed area

Encyclopedia of Non-Point Source Pollution

Toxic Contaminants

Nutrients
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Thermal Stress

Toxic contaminants = chemicals threaten the health of humans, wildlife and plants.
 Heavy metals, petroleum, pesticides, etc. biodegrade slowly remaining poisonous in bodies and the environment for many years.

Sources: industry, business, household, garden and agricultural chemicals; auto emissions

Encyclopedia of Non-Point Source Pollution

Debris

Nutrients
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Thermal Stress

Debris = trash threatens aquatic life and destroys recreational and aesthetic values.

• Trash can spread toxics.
 • Plastic, wire, rope, etc. kills wildlife by entanglement or when swallowed.
 • Trash can injure swimmers, fishermen and boaters.

Sources: illegal dumping and litter.

Encyclopedia of Non-Point Source Pollution



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Thermal Stress

Thermal stress = increase of water temperature above normal maximum or for extended time.

High water temperatures harm native species, can support pathogens and helping non-native species spread.

Sources: heat-absorbing impervious surfaces, loss of streamside trees and other vegetation, shallow streams and flood impoundments, decreased base flow


Land-Use Values

How do we make

Water Quality

Community Plans are blueprints for policies & regulations

Master Plan

policy

zoning

subdivision & site plan






Local Land Use Decision-Making:
Challenges for Officials and Public

Crisis-Driven Priorities

Workload
Board Turnover
Complexity of Environmental Issues



Long Range Planning is a Luxury



Make Time to Plan.

3 Steps for Municipal Action to Prevent NPS

1. Bring Environmental Goals to Community Planning
2. Review/Revise Zoning
3. Review/Revise Site Design

1987 US Fish & Wildlife Service National Wetlands Inventory



Municipal Action:

1. Bring Environmental Goals into Community Planning and Land Use Regulation

Inventory natural resources
Develop conservation policies & goals
Integrate conservation goals with other community goals - Master Plan
Consider adequacy of land use regulations



Natural Resource Inventory

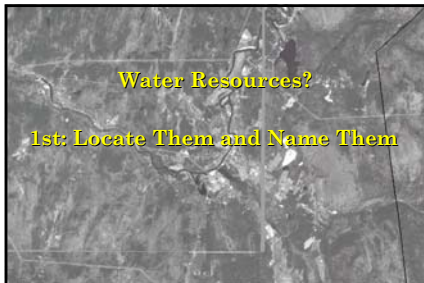
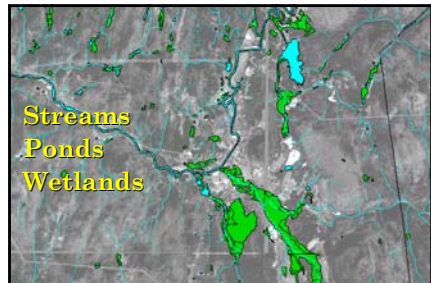
Goals of an Inventory:

- Inventory of Geologic and Biological Resources
- Identify Special and Sensitive Ecological Areas
- Identify Resources / Areas at Risk

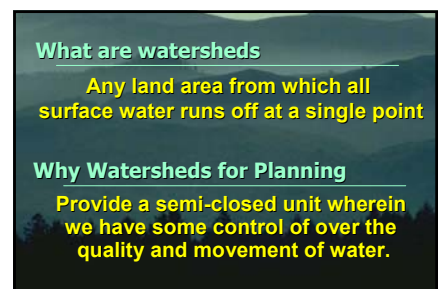
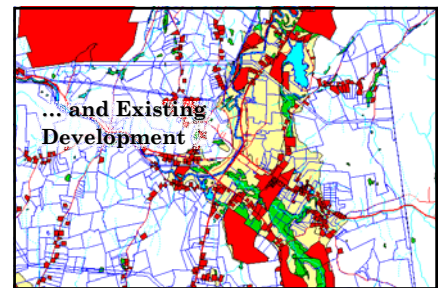
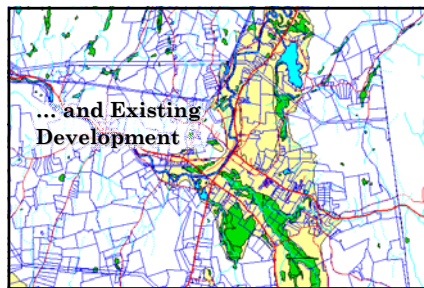
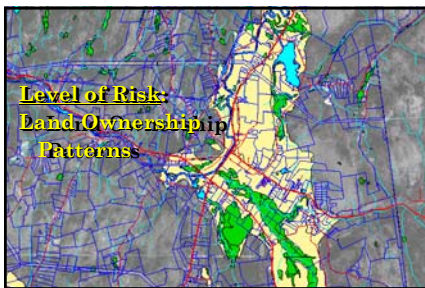
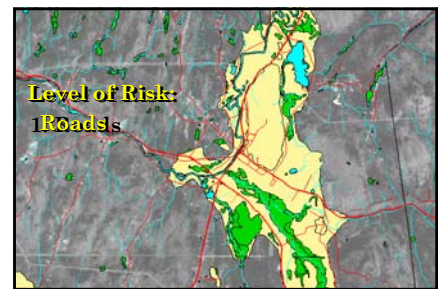


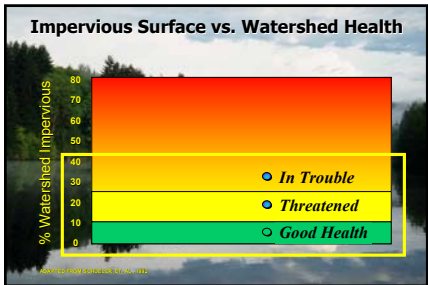
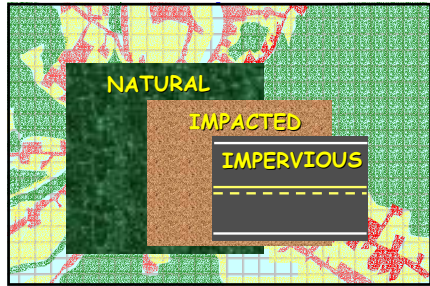
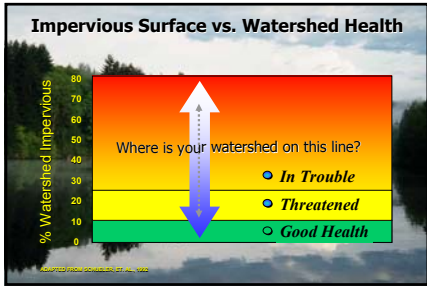
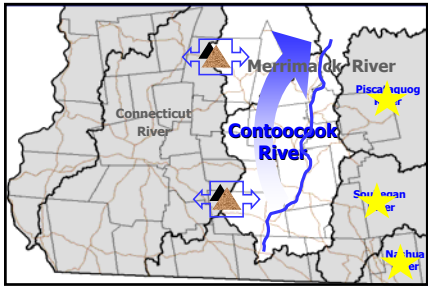
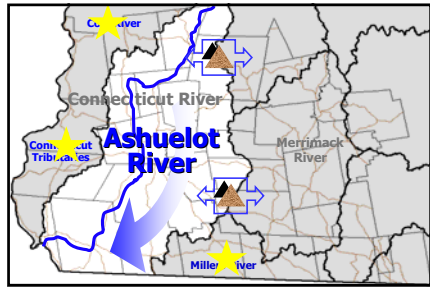
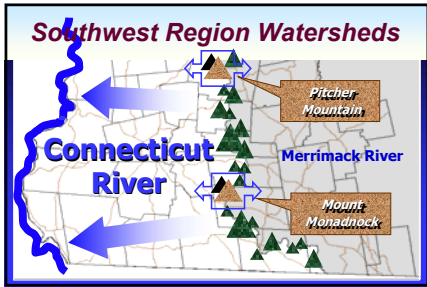
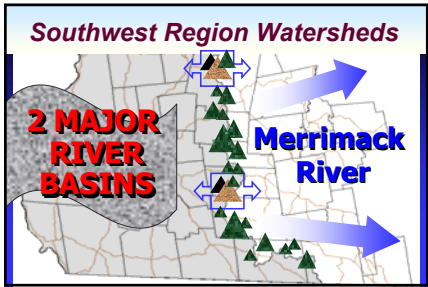
Water Resources?

1st: Locate Them and Name Them

Streams Ponds Wetlands





Municipal Action:

2. Review Zoning

Kinds of Land Use in Sensitive Areas
Shoreland, water supply areas, steep slopes, etc.

Density (lot size) in Sensitive Areas
Shoreland, water supply areas, steep slopes, etc.

% Lot Coverage Throughout

Understand how Private Property Choices

Interact with the Physical Landscape

Land Use to create our Patterns

Consider % lot coverage by land use and lot size ...

Land Use and Lot Size	% Impervious Surface
SHOPPING CENTER	95
COMMERCIAL	85
INDUSTRY	75
<10 acre	65
10 acre	55
100 acre	45
1/2 acre	30
1 acre	25
RESIDENTIAL	20

0 | 20 | 40 | 60 | 80 | 100
 % Impervious Surface

* Adapted from Wilson (1979)

... with the Distribution of Development Town-wide

Centralized, Mixed-Use Development means:

Areas of HIGH Density

... But LOWER Town-wide % I.S.

A Zoning Goal -

Determine town-wide density goals.

Allocate development to areas where land capabilities and infrastructure can best support it.

An Alternate Approach: Open Space Developments

- same number of housing units
- 10-50% less impervious surface
- up to 50% open space
- water resources protected

from hamill, 2002

Mixed Use

- reduces auto traffic & sprawl
- promotes neighborhoods
- is redevelopment-friendly

What About Developed Areas?

- It's STILL a planning issue!
- Every bit of GREEN helps
- Urban redevelopment is critical to reducing sprawl

Municipal Action:

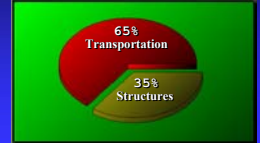
3. Review Site Plan Rules

Parking and Roadway Standards
Stormwater Management Strategies
Other Best Management Practices

The Impervious Surface Site-Budget

Parking Lots
Roads
Driveways
Sidewalks

Offices
Stores
Houses
Patios



Compiled from the City of Memphis, 1994, 1995 Road Report

Site Design Goal: Green is Good!

To reduce impervious surface
For psychological health



There are Alternatives for Parking

Minimize paved parking
for average days.

Engineered
grassed areas can
provide overflow parking.

Road Design Goal: Appropriate Scale



wide
straight
curbed
barren

Intercepts more rain
Absorbs more heat
Channels more water
... may be overbuilt



narrow
winding
shaded

Intercepts less rain
Absorbs less heat
Water infiltrates locally

Best Management Practices - BMPs



A Storm Water Treatment BMP

DETENTION PONDS

capture pollutants,
provide flood control,
and enhance the
appearance of a
subdivision or
commercial site.

Storm Water Treatment BMP



GRASSY SWALE runoff from an
adjacent parking areas to infiltrate on-site
and provides green space in a commercial site.

Storm Water Treatment BMP

CONSTRUCTED WETLANDS

... as part of a greenbelt



retains runoff
capture pollutants
provide wild plant and animal habitat
enhance development.



NEMO Summary

Action for Local Officials:

Water Pollution Today - *NPS*
How Land Use Decision Effect Water Quality
Water Quality Protection in Municipal Land
Use Management:

Environmental Goals in Community Planning
Zoning for Water Quality - *prevent NPS*
Site Design for Water Quality - *prevent NPS*



Put NEMO to Work at Home

Planning Board Workshops *with SWRPC*

Environmental Goals in Community Planning
Natural Resource Inventory
Your Community in the Watershed

Zoning for Water Quality - *prevent NPS*

Site Design for Water Quality - *prevent NPS*

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Keep It Green